ADDRESS OF THE PRESIDENT,

Prof. G. B. Howes, Sec. L.S., etc.

Delivered 12th *February*, 1897.

Ladies and Gentlemen,

Since it is your wish that I once more appear as your attorney, permit me to offer a few remarks somewhat by way of development of the lines which I last year adopted, for there is no reason why Presidential Addresses should not be continuous, and let us ask what is the present position of our branch of science, and what the most fruitful field for its immediate development.

Our year opened full of promise for the Malacologist, for hardly had it dawned when there reached us a paper by Girard[1] on the remarkable 'bivalved pulmonate' (unfortunately so called) *Thyrophorella Thomensis*, in which he claims to have settled the systematic position of that animal. Be its 'lesser valve' what it may, a product of overgrowth of the peristome or a protective lid *sui generis*, it is clear that it presents us with a physiological condition for the counterpart of which we turn to the opereulate Rugosa among Corals and the unique *Rhodosoma*[2] among Tunicates. Once again was the zoological mind turned to the part played by homoplasy; and while thus exercised there came before it the full monograph of our distinguished contemporary Paul Pelseneer, upon the "Air-breathing Prosobranchs and Gill-breathing Pulmonates,"[3] in which, suffice it to say, our knowledge of this important and fascinating subject is materially extended, and our author strengthens his conclusion that *Siphonaria* and *Gadinia* are pulmonates; whilst in reviewing this paper Simroth has shown good reason for suspecting[4] that *Ianthina* may be an 'air-breather.'

M. Félix Bernard, not content with the continuation of his epoch-marking work upon the Pelecypodan hinge, early in the year delighted us with a description[5] of the structure and development of a new Eulamellibranch (*Scioberetia australis*), which small organism he obtained off the ambulacra of a viviparous Spatangoid (*Tripylus cavernosus*), with which it is commensal, from Cape Horn. Its enclosed shell, its gills, and pallial chamber, are of much interest; and his promised discussion of its affinities has for us a special association,

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[1] A. A. Girard, Journ. Sci. Acad. Lisbon, ser. II, tom. iv, p. 28.
[2] *Chevreulius* of Lacaze Duthiers, Ann. Sci. Nat. (Zool.), ser. III, tom. iv, p. 293.
[3] P. Pelseneer, Arch. Biol., tom. xiv, p. 351.
[4] H. Simroth, Zool. Centralbl., Bd. iii, p. 214.
[5] F. Bernard, Bull. Mus. Hist. nat. Paris, tom. xxvii, p. 364.

in consideration of the views expressed in Mr. M. F. Woodward's excellent paper on *Ephippodonta* published in the first volume of our "Proceedings."

The year which opened thus sensationally, did not continue one of surprises for the Malacologist, but rather one of that steady work which marks real progress. Firstly, let me consider it as affecting our Society.

Our members now number 162. The addition to our roll of the names of W. T. Blanford, H. A. Pilsbry, C. E. Beecher, and A. Pavlov, is a guarantee of appreciation by those most competent to judge of our merits; and as our financial position has improved during the year, we have no cause for dissatisfaction with our worldly progress.

One familiar face has temporarily disappeared from our midst, in the removal of Mr. S. Pace to Torres Straits, to conduct during the next few years a series of experiments in pearl culture, and to develop the pearl fisheries.

We have published papers during the year by our distinguished foreign members Dr. H. Simroth and Mr. H. Suter, and by Professor Gilson, of Louvain, one of our latest recruits; and our main supporters, Messrs. Edgar Smith and E. R. Sykes, have given us liberally of the results of their labours.

Our most trustworthy member, Mr. G. C. Crick, has laid before us two short communications belonging to that class of which, to my mind, we want more; i.e. they are palæontological. Both are in every way worthy the material described, and of our glorious national collection of which it forms part. The consummate care with which the author has worked out his details, the skill of his reconstructions, the cautiousness of his generalizations, and the beauty of the accompanying illustrations, appear to me equally commendable. An author to whom trouble is a pleasure where truth is to be revealed, to whom order is second nature, and an artist who, if he will, can in some departments outrival his foreign contemporaries, under the guidance of our Editor, have given us a scientific treatise which, being also a finished work of art, realizes the ideal of Huxley, our great master of science and English composition, an ideal which he was never tired of upholding to his followers. Authors of such works, which take time, are nowadays voted slow; better, however, one such than a dozen of the slipshod, ill-conceived, oft-inflated 'papers,' begotten of mere ambition and desire for notoriety, that at times cover, but do not adorn, the pages of our scientific journals.

Nor have our exhibits been one whit behind.

We have been gratified by the sight of living *Petricola pholadiformis*, collected on our own coasts, the acumen of our members Messrs. Cooper, Crouch, and Kennard having shown us that the species is apparently becoming acclimatized in British waters. Mr. Bullen Newton has excited our interest and imagination, by laying before us, on behalf of our honoured member Sir Rawson Rawson, the

original coloured drawings of the shell and animal of *Pleurotomaria Quoyana*, from which the figures in the 'Blake' Monograph were drawn. Mr. Fulton has openly put upon our table collections of shells, notably of *Amphidromus*, of exceptional completeness and perfection, such as are only brought together under a labour of love; whilst, with his *Conus gloria-maris*, Mr. Sowerby has appealed to our æsthetic as well as to our common sense.

The exhibition of skiagraphs of shells and living molluscs by Mr. J. Green and Mr. J. H. Gardiner is especially noteworthy, as marking the most extensive and first systematic attempt to apply the latest epoch-marking discovery in physics to the study of our chosen class of animals. To be able to see the clausium through the shell-wall, and to determine the septal lines and muscular impressions of the *Nautilus* shell, prior to the removal of the animal contained within it; to be able to work out the valve-slits of a Polyplacophoran, while the plates are yet *in sitû* beneath the girdle; and to detect the folds on the columella of *Voluta* the whole way up, even on the further side of the shelly pillar, is to be in possession of a new and powerful method of observation, which must be productive of good results. Mr. Green and Mr. Gardiner, in having shown us how best to proceed with this, have done us a most useful service.

So long as we are in a position to maintain the present standard of our exhibits, we need have little fear of lack of interest in our meetings.

With extending influence, it is only reasonable to suppose that the sympathies of others will be accorded us; and I am very happy to inform you that the Rev. J. E. H. Thomson, who last year went into residence at Safed, has most willingly undertaken to dredge and collect for us during the next three or four years in Galilee and the neighbouring Lakes, the necessity for investigating the molluscan fauna of which was emphasized by the late Paul Fischer.

My friend and former pupil, Mr. J. E. S. Moore, has just returned from the African Lakes with a goodly dredging of Mollusca, including material for the study of development; and I am hopeful that ere long we may see some of them upon our table.

With a view to extension of our influence with explorers, our Council early in the year considered a scheme for the compilation of a series of directions for search, capture, and preservation of Mollusca. A small Committee was formed, with two members for each department of the work, and their notes are now in an advanced stage. In taking this step, your Council were encouraged by the success of the issue by the Anthropological Institute of Great Britain and Ireland of their "Notes and Queries," and were especially mindful of the necessity for securing accurate observations upon the Land-shell Fauna of the Oceanic Islands, before the disturbing influences of the settler and his flocks and herds render them for ever unattainable.[1]

[1] It is sincerely to be hoped that should the plea of the British Association Committee for the exploration of the Islands of the Pacific lead to action, the Land Mollusca will receive adequate attention.

During the year, the hand of death has deprived us of Dr. Auguste Brot, of Geneva, and of B. Schmacker, both members of our Society, and both contributors to our "Proceedings." Dr. Brot, well known in connection with the "Conchylien Cabinet" as the chief authority on *Melania* and allied genera, passed away on August 30, at the age of 75. Schmacker died at Yokohama, on March 26, at the early age of 44; and in him we lose an enthusiastic collector, who devoted special attention to Chinese and Japanese Land Mollusca, as his papers in collaboration with Dr. O. Boettger testify.

In the death of Professor G. A. Pirona, of Udine, we mourn the loss of a talented naturalist and philologist, who embraced within the sphere of his many occupations the study of the Land and Fresh-water Mollusca of his native district, and of the Hippurites; whilst by the decease of H. D. von Nostrand we have lost an enthusiastic collector and conchologist.

I cannot pass unnoticed the recent decease of the veteran "Naturalist of the Cumbraes," David Robertson, who died at Millport in his ninetieth year, respected by all earnest Zoologists, as one who made the most of his surroundings and developed that which he could command. He was a keen observer of nature, and the merits of his sixty years' work in science (in much of which he was materially assisted by his wife) were in 1895 recognized by the University of Glasgow, which bestowed on him the degree of D.C.L. When by many all but forgotten, he reappeared, in association with Dr. J. Murray, during his exploration of the Firth and West Coast of Scotland and the work of the familiar 'Ark.' His last public act was the cutting of the first sod on the site of the new Marine Station at Millport, now nearing completion, that owes its existence largely to his untiring energy and enthusiasm. He was of the old order of 'field-naturalists,' now, alas! but few in number, and was also a palæontologist. Since his death was in my hearing recently commented upon as that of 'another old fossil,' I am constrained to point out that some of our latest work in 'bionomics' has borne testimony[1] to the value and accuracy of observations made by him in 1861.

It would not be difficult to produce recent work in Malacology in which gross errors might have been avoided had more attention been paid to the published work of our predecessors. "Sire," perks the youth to his senior, "I proceed to swallow and digest thee with all thou knowest." Let it be added that he occasionally gets choked!

Turning now to consider progress at home, we note the discovery, by Mr. Garstang, of the Marine Biological Laboratory at Plymouth; of a new British *Doris*[2] (*D. maculata*); and of the Neomenian genera *Myzomenia* and *Rhopalomenia*, hitherto unrecognized in British Waters, with a description of which he has honoured our "Proceedings." Mr. Garstang's specimens were discovered in the English Channel at

[1] Cf. W. Garstang, Journ. Mar. Biol. Assoc. (N.S.), vol. iv, p. 225.
[2] W. Garstang, t.c., p. 167.

a depth of 25–30 fathoms; whilst about the same time Professor Haswell, of the Sydney University, recorded[1] a similar find in the harbour of that city. This welcome extension of our knowledge of the range of these remarkable animals was but a question of time; but, as concerning the British seas, it may be remarked that there have long been placed on public exhibition in the Molluscan galleries of the British Museum of Natural History, specimens of *Neomenia carinata* dredged by Dr. J. Murray during 1887–8 in 50–70 fathoms at Upper Loch Etive and Loch Hourn; and that in 1891 Professor Haddon recorded[2] the capture of a Neomenian on the west coast of Ireland at 80, if not also at 55, fathoms.

We note with pride that steps are being taken towards rearrangement of our matchless national collection of recent Mollusca. In this our Vice-President, Mr. E. A. Smith, and those who are helping and advising him, are performing a public service; and it is worthy of remark that, as the work progresses, Dr. H. Woodward, Mr. Crick, and their associates in the Geological Department, are giving us descriptions of fossil molluscs no less valuable and unique. Specimens such as those of the *Palaeoctopus Newboldi* from the Cretaceous of Lebanon,[3] and of *Acanthoteuthis speciosa* from the Lithographic Stone of Eichstädt,[4] like so much that is preserved in our National Museum, may well arouse the envy of our foreign contemporaries. Co-operative action is the secret of their acquirement. During the present year the observant eye of Mr. C. Davies Sherborn was attracted, while walking with a friend (Dr. Rowe), by a monstrous Ammonite on the beach near Brighton. No time was lost in communicating with the authorities, who despatched our friend Crick and an assistant to the scene. Sufficient this for anyone familiar with the conduct of affairs of the Geological Department of our treasure-house; and, as the result, there now adorns the collection a 44-inch example of *Ammonites* (*Haploceras*) *leptophyllum*, which is an object to behold and live up to.

General progress in the study of our recent Mollusca has been during the year largely associated with the work of expeditions—conspicuously with those of the "Albatross" and "Princess Alice," of the German Plankton, and the Horn Expedition—of which I propose to treat in a more fitting portion of my Address. The voyage of the "Caudan" has furnished material for papers by Joubin and Locard, and the Mollusca collected by the Dutch Expedition to Central Borneo have been reported upon by Schepman.[5]

Of faunal papers on Land Mollusca, I would name those of our Vice-President, Mr. Edgar Smith, referring to Celebes, Batchian, Ternate,

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[1] W. A. Haswell, Journ. Sydney Univ. Medic. Soc. (Hermes Medic. Supplem.), vol. i, p. xxxi.

[2] A. C. Haddon, Proc. Roy. Dublin Soc. (N.S.), vol. vii, pp. 258 and 260.

[3] H. Woodward, Quart. Journ. Geol. Soc., vol. lii, p. 229; Geol. Mag., 1896, p. 567.

[4] G. C. Crick, Geol. Mag., 1897, p. 1.

[5] M. M. Schepman, Notes Leyden Mus., vol. xvii, p. 145.

and Gilolo, in our own "Proceedings"; and on Mollusca from Trinidad in the Journal of Conchology.[1] The Canaries have been dealt with in our own pages by Gude; and, subsequently to Smith, Von Möllendorff has written[2] upon the Mollusca of South Celebes; while, in conjunction with Quadras, he has briefly described[3] a number of species from the Philippines, whence several genera have been listed by Boettger,[4] with descriptions of new forms.

Dall has published an elaborate review of our knowledge of the terrestrial fauna of the Galapagos Islands,[5] not unmixed with doubtful speculation, in describing the collections made by Dr. G. Baur in 1890. Valuable critical reviews have been given by Fulton on *Amphidromus*, and Wagner[6] on *Daudebardia*; and Hidalgo has published some extensive critical notes on the species of *Cochlostyla*.[7] There has also appeared the first of what we hope may prove to be a series of papers on North American Land-shells, by Pilsbry and Vanatta, dealing both systematically and anatomically with *Ariolimax* and *Aphallarion*.[8] The same authors, too, have issued a Catalogue of the genus *Cerion*; whilst the armature of the various species of *Corilla* and *Plectopylis* has been worked out and figured by Gude.[9]

Central Asia has furnished new forms to Westerlund; East Africa to Von Martens; and Borneo and the Hawaiian Islands have received special attention. New forms from Bombay have been described by Melvill in our "Proceedings," and from the Loyalty Islands elsewhere, in conjunction with Standen. A number of new species of Pleurotomidæ have been recorded by Hervier[10] from New Caledonia; and in generic work, De Rochebrune on *Ceratosoma*,[11] and Lahille on the Volutes of Argentina,[12] call for comment.

A Catalogue of the marine fauna of the Pacific coast of Canada has been compiled by the Rev. G. W. Taylor, in which he enumerates 279 species, and to which he adds a faunal list of fresh-water forms.

Of the "Conchylien Cabinet" several parts have appeared, dealing with *Helix*, *Cerithium*, *Columbella*, and the *Bullacea*. The "Manual of Conchology" by Pilsbry has steadily progressed: in the Marine series the Gastropoda are finished; in the land, the Bulimoid forms have received attention; new subgenera have been described, and in separating genera the sculpture of the protoconch has been utilized. Simroth, in Bronn's "Thier-Reich," has commenced the Gastropoda. Our Editor has assisted in the English translation by H. and M. Bernard

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[1] E. A. Smith, Journ. Conch., vol. viii, p. 231.
[2] O. von Möllendorff, Nachr. Deutsch. Malak. Ges., 1896, p. 133.
[3] J. F. Quadras and O. von Möllendorff, t.c., p. 81.
[4] O. Boettger, t.c., p. 41.
[5] W. H. Dall, Proc. Acad. Nat. Sci. Philad., 1896, p. 395.
[6] A. J. Wagner, Denkschr. Akad. Wien, Bd. lxii, p. 609.
[7] J. G. Hidalgo, Journ. de Conch., tom. xliv, p. 5.
[8] H. A. Pilsbry and E. G. Vanatta, Proc. Acad. Nat. Sci. Philad., 1896, p. 339.
[9] G. K. Gude, Sci. Gossip (N.S.), vol. iii, p. 126 etc.
[10] R. P. J. Hervier, Journ. de Conch., vol. xliii, p. 141, and vol. xliv, p. 51.
[11] A. T. de Rochebrune, Nouv. Arch. Mus. Hist. Nat. Paris, ser. III, tom. vii, p. 119.
[12] F. Lahille, Rev. Mus. La Plata, vol. vi, p. 293.

of Arnold Lang's "Text-Book of Comparative Anatomy" so far as it applies to the Mollusca. Mr. J. W. Taylor has issued a further part of his work on British Land and Fresh-water Mollusca, devoting much attention to anatomy; and Mr. L. E. Adams has published a second edition of his "Collector's Manual." Last, but not least, our thanks are due to the Editor of the Journal of Malacology, and to our Secretary and Mr. S. Pace, for their enterprising "Bibliography," which we hope will continue a leading feature of that periodical.

For the student of fossil forms, the year has been noteworthy. Our Corresponding Members, Dr. R. J. Lechmere Guppy and Professor W. H. Dall, have written a joint work[1] entitled "Descriptions of Tertiary Fossils from the Antillean Region," the horizons whence they were obtained ranging from the Pliocene to the Eocene. A new genus, *Strombinella*, is described from the Oligocene of St. Domingo. It appears at first sight like a strongly sculptured *Terebra* of the section *Acus*; the aperture, however, is that of *Anachis*, and it doubtless has much the same relation to this as *Æsopus* has to *Astyris*.

Professor Sacco's stupendous work still progresses.[2] Part 20 has appeared during the year, and comprises the Cœcidæ, Vermetidæ, Siliquariidæ, Phoridæ, Calyptræidæ, Capulidæ, Hipponycidæ, Neritidæ, and Neritopsidæ. In this we have another appalling addition to the number of 'varieties' of divers species of fossil Mollusca. Fortunately, however, considerable revision has been effected with the species themselves; and the systematic position of many has been so carefully considered that, despite its faults, the work will constitute a standard of reference on Pliocene Mollusca for some time to come.

A paper by our member, Mr. G. B. Pritchard, on the fossil fauna of Table Cape beds, Tasmania, deals principally[3] with the Mollusca. The summary of species records one cephalopod, 153 gastropods, and 65 pelecypods; and the whole is an excellent piece of work, apparently based chiefly on the writings of Ralph Tate, but containing some welcome criticisms and addenda.

Dr. Paul Oppenheim, in a work entitled "Die Eocaenfauna des Monte Postale bei Bolca im Veronesischen," dealing largely with a Molluscan fauna which has often been partly described, and is of much interest from a geological point of view, records[4] some large Cerithidæ and Naticidæ. Large Lucinidæ are also described, which suggest those of the Eocene of North Western Europe. The state of some of the fossils is unfortunately bad, and the nomenclature somewhat antiquated.

The volume of the Palæontographical Society contains four monographs of especial interest to us. That on the "Fauna of the

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[1] R. J. Guppy and W. H. Dall, Proc. U.S. Nat. Mus., vol. xix, p. 303.
[2] F. J. Sacco, Molluschi Terr. Terz. Piedmonte e Liguria. Turin.
[3] G. B. Pritchard, Proc. Roy. Soc. Vict. (N.S.), vol. viii, p. 74.
[4] P. Oppenheim, Palæontographica, xliii, pp. 125-221, 8 pls. Stuttgart, 1896.

Marwood and Pilton Beds of North Devon and Somerset," by our member, the Rev. G. F. Whidborne, is a useful epitome. The systematic position of most of the species of Mollusca described appears to us, however, doubtful, and this monograph will be of best use later on, when the field comes to be more thoroughly worked out.

Carbonicola, *Anthracomya*, and *Naiadites* form the subject of an appendix to his previous work by Dr. Wheelton Hind, also a member of our Society. There is given on p. 171 a geological section of the beds of the shore at Dalmeny, but its utility is seriously marred by the omission of any statement as to the thickness of the beds. Dr. Hind also devotes eighty pages to the "British Carboniferous Lamellibranchiata" (Part I), dealing with the Mytilidæ. The assignation of a systematic position to many of the species of *Lithodomus* depicted on pl. ii is, to say the least, bold. The greater part of this work is confined to the "Introduction" and "Bibliography," which latter we could well wish revised and materially extended.

Our member, Mr. W. H. Hudleston, F.R.S., contributes the ninth number of Part I of his work on the "Jurassic Gastropoda," concluding those of the Oolite. The monograph is accompanied by an alphabetical index, showing geographical distribution in England.

Our indefatigable Corresponding Member, M. Cossmann, has published the second livraison of his great work "Essais de Paléoconchologie comparée," comprising the Tubiferidæ, Icteriidæ (nov. fam.), and Nerineidæ, which the author elevates into a new suborder, Entomotæniata. The systematic description of the Prosobranchiata is also commenced, and includes the Terebridæ, Pleurotomidæ, and Conidæ. The work throughout bears evidence of very careful preparation. A number of new genera and subgenera are proposed; but we cannot say that the method of classification, though it follows in part the example set by the late Paul Fischer in his "Manuel," will be received with much satisfaction by English students. One of the most interesting features of the work is the careful manner in which the author cites examples of species occurring along definite geological horizons, whereby the reader is presented with a comprehensive review of the range in time of even the subgenera and 'sections.' The work is destined to become classical.

There has also appeared during the year, under the direction of M. Cossmann, a "Revue critique de Paléozoologie." It will appear every three months, and is intended to contain comprehensive reviews of current work. It to a certain extent takes the place of the palæozoological section of the recently defunct "Annuaire Géologique Universel," and it cannot fail to be of the greatest use to us all. M. Cossmann is to be congratulated on the undertaking.

The Memoirs of the Geological Survey of India ("Palæontologia Indica") of the year embody two important monographs on the Cephalopoda, by Professor W. Waagen and Dr. Carl Diener. Dr. Waagen deals with fossils of the Ceratite formation, which apparently represents the Trias of Europe, although "it is not yet possible to

say with certainty what parts of the Trias may be represented by the Ceratite formation of the Salt Range." The greater part of the work is devoted to the Cephalopoda, and many new genera and species are described. Dr. Diener's monograph describes the "Schlaginweit Collection in Munich, Griesbach's in the Geological Museum of Calcutta, with Blanford's and Stoliczka's type-specimens"; and last, but not least, the large number of fossils collected in 1892 by the expedition to Johár, Panikhanda, and Hundés, in which Griesbach, Middlemiss, and Diener took part. A new genus (*Buddhaites*) is described, besides a great number of new species; and the work, like that of Waagen beforementioned and all the volumes of the "Palæontologia Indica," is exceedingly well illustrated.

In the "Denkschrift"[1] of the Vienna Academy, Dr. E. Mojsisovics von Mojsvar, who has already done so much excellent work on the Cephalopod fauna of the Trias, particularly of Austria, describes in full that of the Upper Trias of the Himalayas. The material forming the basis of the work consists of the collections of Dr. Diener and Messrs. Griesbach and Middlemiss, made during their abovementioned expedition to the Himalayas. As was to be expected, the author describes many new species, and institutes new genera, subgenera, and large subdivisions. His descriptions are accompanied by numerous plates, executed in the finished manner to which we are accustomed in his writings on the Austrian Trias.

The work, I believe, is being translated, to appear subsequently in the "Palæontologia Indica," where it will probably form Part I of a series of monographs on "Himalayan Trias Fossils," of which Dr. Diener's work on the Muschelkalk of the same region forms Part II.

G. Holm has published a work on *Endoceras*, in which,[2] briefly reviewing the literature, he passes to the description of the apex. He recognizes two types, but considers a division of the genus impracticable, since the apical portion is known in but few examples, and not at all in the type-species. He groups the species exhibiting the conical apex into two subgenera, for one of which he adopts the name *Nanno*, previously used generically by Clarke, and afterwards adopted by Hyatt, and for the other he proposes *Suecoceras*.

One regrettable feature of the year's work has been the tendency towards reversion to the trinomial system and the too rigid adherence to rules of priority. When, in an age in which science is popular, *Aplysia* becomes *Tethys*, and *vice versa*, and, in one of overcrowding of literature, it is thought desirable to discriminate between 'types,' 'paratypes,' and other sorts of types, it were no wonder did the wayside naturalist turn from us in despair. For the purists *Ichthyosaurus* ought to go, *Troglodytes* becomes *Anthropopithecus*. Convenience and the fitness of things must be considered. The effects of extreme specialization are here but too evident; one man describing as the result of a life's labours 'characters' which it requires the

[1] M. E. Mojsisovics von Mojsvar, Denkschr. Akad. Wien, Bd. lxiii.
[2] G. Holm, Geol. Fören. i Stockholm Förhandlg., Bd. xviii, p. 394.

experience of a life to appreciate. If this course is to continue, let us boldly replace *Homo sapiens* by *Mendax simplex*, and have done with it!

In the department of Marine Biology the year has witnessed an exceptional activity at all points of the compass. Our Japanese friends have described and worked out a new species of *Opisthoteuthis* (*O. depressa*),[1] and they continue to discover new and remarkable marine organisms.[2] Rumours are current of a South Australian Marine Station; and the attempt which is being made to develop the resources of the West Indies has met with considerable support at the hands of the Zoologists of the Johns Hopkins University, who during the season visited Port Henderson for purposes of systematic study.[3]

As a kindred new departure, the members of the Columbia University, New York, organized a summer expedition to Puget Sound, where a laboratory was equipped, and dredging, plankton collecting, and other modes of investigation were carried out; and their preliminary report announces, as a leading result,[4] the careful study of *Scutella* and *Entoconcha*, and the collection of numerous mollusca, the working out of which will be looked for with intense interest.

The North Pacific is this year more than ever to the front, and will keep our friends Mr. Edgar Smith and Mr. Sykes busily engaged for some time to come, since Mr. R. C. L. Perkins is still collecting, under the auspices of the Joint Committee of the Royal Society and British Association. More than this, however, for the extension to him of substantial support by the Trustees of the Bernice P. Bishop Museum in Honolulu, has been followed by the welcome announcement[5] of a proposal to erect a biological laboratory for the Hawaiian Islands at the princely cost of some £150,000, which Mr. C. R. Bishop would seem willing to defray. The allusion in the preliminary notice to the facilities which will be afforded to American and Japanese zoologists is a sure sign of the times; but we hope that distance will not deter British workers from visiting the locality, as seems to be anticipated.

At home, all eyes have turned northward, two important events having taken place across the border, viz., the laying of the foundation-stone of a new marine station at Millport on October 18, and the completion and opening of the "Gatty Marine Laboratory" at St. Andrews—the latter wholly, and the former largely, the outcome of voluntary bequest on the part of persons who have lived to appreciate the value of biological investigation. I need but remind you of the pioneer work in marine zoology of Professor W. C. McIntosh,

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[1] I. Ijima and S. Ikeda, Journ. Coll. Sci. Imp. Univ. Japan, vol. viii, p. 323. Cf. also Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 74.

[2] Cf. Zool. Anz., Bd. ix, p. 249.

[3] Cf. J. E. Duerden, Journ. Instit. Jamaica, vol. ii, p. 268.

[4] Cf. Zool. Anz., Bd. xx, p. 14.

[5] Cf. Rev. Sci., ser. IV, tom. vi, p. 631.

and of his untiring devotion to it for a period of over thirty years, to justify the remark that the munificent gift of the Gatty Laboratory is a fitting recognition of his labours, upon which he and his ancient university are alike to be congratulated. Investigator, raw student, and collector, have always received the greatest encouragement at his hands, and he has ever given unstintingly of his rich resources in the advancement of education.

The Millport Laboratory, now near completion, as I have already remarked, was the cherished ambition of the "Naturalist of the Cumbraes." Having secured its foundation, he lived intent on endowing it from his collections, the richness of which is known only to marine zoologists. Although the hand of death has intervened, we sincerely hope it will not have rendered it impossible in this manner to ensure him a fitting memorial. A commencement has already been made with a suggestive piece of work, in which Robertson himself had a hand,[1] upon hermaphroditism and the influence of nutrition on sex in the limpet.

Aberdeen follows in the wake, with the announcement that its Town Council, at the suggestion of Professor Alleyne Nicholson, have, as a wholly provisional arrangement, equipped an old bathing station as a Marine Aquarium.

Once again has private enterprise, a characteristically English method of procedure in the advancement of Science, come nobly to our aid. And, since even in scientific circles there are not wanting persons apparently unable to distinguish between the claims of a Marine Biological and a Chemical Institute, as concerning choice of locality, it may be opportune to remark that for work in economics which even they desire, involving, as a basis for observation and experiment, the determination of the habits, range, and causes of migration of marine organisms, there is demanded, as a first necessity, the girdling of our seas by a series of properly equipped observatories, as a means by which collated investigation should be possible for long periods over wide areas. Our requirements are essentially those of the seismographers, who are raising a similar outcry. It is only now that the possibility of such collective investigation is dawning; and we note with satisfaction that a biologically first attempt in the desired direction has just been made[2] by the able Director of the Plymouth Marine Station.

Briefly to consider the year's work of expeditions, as specially affecting our chosen class of animals, there stands foremost for recognition the Report by Messrs. Dautzenberg and H. Fischer on the Deep-sea Fauna dredged by the "Princess Alice" in 1889–90, at depths of from 40 to 4,000 metres in the Mediterranean and off the Azores. Of the 153 species of Gastropoda and Chitons recorded, 86 are described as new.

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[1] Cf. J. F. Gemmill, Anat. Anz., Bd. xii, p. 392.

[2] E. J. Allen, "Distribution of Marine Plankton": Journ. Marine Biol. Assoc. (N.S.), vol. iv, p. 408.

There reached us early in the year another important report,[1] by our zealous foreign member, Dr. W. H. Dall, upon the Mollusca collected in deep water near the Hawaiian Islands, during the cruise of the "Albatross" in 1891. A conspicuous feature is the working out of the anatomy of a new species of *Spergo* (*S. glandiniformis*) and of the author's genus *Euciroa*, concerning the structure of the gills and discussion of the affinities of which we await with much curiosity the comments of our Belgian contemporary Paul Pelseneer.

Our Vice-President, Mr. Edgar Smith, has given us an admirable report[2] on some new deep-sea Mollusca from the "Investigator" collection; and our respected foreign member, Dr. H. Simroth, has contributed a report upon the Acephala of the German Plankton Expedition, noteworthy for the description of a new and minute pelagic genus (*Planktomya*), and full of subsidiary matter of the greatest service to the student, but, alas! marred by a regrettable feature, to which I shall return.

From the pen of Dr. Rudolf Sturany there has come a monograph on the Mollusca dredged by the Austrian Deep-sea Expedition by the "Pola," during the years 1890–4, in which, on comparison of the Tertiary fossils of Sicily and Italy, the well-founded conclusions of Fischer and others as to the uniformity of the molluscan fauna of the deeper waters of the Mediterranean, and that the deep-sea fauna of the Mediterranean would appear to have had a Northern Atlantic origin, are confirmed.

At the Liverpool meeting of the British Association, the Committee for the study of the Marine Zoology, Botany, and Geology of the Irish Sea, of which I have the honour of being a member, presented its final report. I much fear my own part has been that of feeding the fishes and other sea-monsters rather than of assisting to work them out; but our friend Professor W. A. Herdman, and his well-organized band of Liverpoolians, have given us an exhaustive list of captures, which include numerous novelties. The controversy at Ipswich concerning that portion of the work which deals with the "zone of deep mud," is fresh in the minds of some of us. A special feature of the undertaking was the careful localization and study of the bottom deposits; and in the hands of Mr. Clement Reid, of the Geological Survey, results of the greatest interest to the student of molluscan chorology appear likely to accrue.

The Antipodes have this year been the centre of exceptional attention by explorers. The party headed by Professor W. J. Sollas sent out in H.M.S. "Penguin," under the joint auspices of the Royal Society and British Association, to investigate the structure of a coral reef by boring and sounding, were baffled in their main object, but we hope not beaten. Rich collections have, however, been made; and since Mr. Hedley, of the Sydney Museum, accompanied the expedition as 'Naturalist,' Malacologists would seem assured of a good

[1] W. H. Dall, Proc. U.S. Nat. Mus., vol. xvii, p. 675.
[2] E. Smith, Ann. and Mag. Nat. Hist., ser. VI, vol. xviii, p. 367.

harvest. Thanks to Admiral Wharton, R.N., F.R.S., the soundings of this expedition have been placed in the hands of our able member Mr. W. H. Burrows, who is now working them out.

Dr. Willey has continued his observations upon *Nautilus*; and during a sojourn in Sydney he worked out and published details of considerable interest, not only upon Mollusca, but upon the enigmatical *Ctenoplana*, of which he has described[1] a new species (*C. rosacea*). He has left Sydney for New Caledonia, and carries with him our best wishes.

The impetus given to the study of the Polyplacophora by Pilsbry's revisionary monograph and the adoption of its newer methods have been most marked in their effects on the study of the Australian and Novozelandian forms. The papers by Pilsbry,[2] and those by Bednall, Suter, and Sykes read at our meetings, well-nigh cover the field; and when we reflect upon the discovery during the last few years of unique and engrossingly interesting Sponges and Crustaceans, to say nothing of Flat-worms and Echinoderms, by Dendy, Chilton,[3] Farquhar,[4] Thomson,[5] and others, we cannot but congratulate our New Zealand brethren on the result.

Finally, there are now before us the complete report and narrative of the expedition into the interior of Australia during 1894, which bears the name of W. A. Horn, who so liberally organized and endowed it, with the aid of the South Australian Government. Results of the greatest interest have been obtained in Zoology, Botany, Anthropology, and Geology; and, on consideration of the exceptional difficulties under which the little band of investigators were placed in working them out, they have merited our profound thanks. To Professor Baldwin Spencer, upon whom fell the task of general organization and editorship, we owe a debt of peculiar gratitude; for, shortly after the return of the expedition to civilization, on receipt of tidings of heavy rain in the interior, he packed bag and baggage and returned to collect whatever was afloat. Not only so, but he is now again on the spot. While, thus, the success of the expedition is largely due to his untiring energy and enthusiasm, we may hope for further results at his very competent hands; and we congratulate him on his determination to develop the knowledge of the indigenous fauna of his adopted land.

Professor Tate and Mr. Hedley are responsible for the work done upon some 2,000 mollusca, now preserved in the Australian Museum; and there has arisen good reason for believing that these are the survivors of a primitive fauna, and that many of them, under the effects of isolation and marked climatic changes, have acquired the habit of reproducing immediately the conditions are favourable. The

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[1] A. Willey, Quart. Journ. Micro. Sci. (N.S.), vol. clv, p. 323.
[2] H. A. Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, p. 69.
[3] C. Chilton, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 163.
[4] Farquhar, Journ. Linn. Soc. (Zool.), vol xxvi, p. 186. [Now in press.]
[5] G. M. Thomson, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 285.

land-shell fauna, but little known prior to the expedition, has been most considerably extended, and in its characters it is found to approximate that of Sub-Tropical West Australia.

The study of the Australian Mollusca, as you are aware, has played an important part in the recent revival of controversies concerning the history of the Australian continent, and notably in the delimitation of Tate's Larapintine or Central Eremian Region.

Mr. Hedley has contributed to the Report upon the Mollusca of the Horn Expedition, an appendix dealing with the anatomy of some few forms which were sufficiently well preserved for dissection, and has arrived at the instructive conclusion that in relying wholly upon salient superficial characters of shells and 'teeth,' we appear to be associating together species markedly distinct in the structure of their viscera. Mr. Hedley approaches the study of the Mollusca from the broader standpoint of Pilsbry, who has done so much for recent advancement of Malacology; and, since his work has thus a special value, I the more readily draw your attention to his ingenious theory[1] of instability of the 'Antarctica,' for in a combination of this with the theory of a South Pacific Mesozoic Continent, as originally conceived by Huxley, the nearest approach to the truth concerning that now vexed question appears to me to lie.

Progress in the study of minute anatomy and development during the year has borne good fruit; and foremost for recognition there stands the third part of F. Bernard's monograph[2] upon the hinge of the bivalved molluses, to which I have already alluded, and upon which our Editor gave us, in the autumn, an instructive demonstration. Bernard's announcement that the ligament is invariably internal in origin, that the various types of cardinal teeth are due to irregularity in growth of a series of ridges, and that the ligament of the adult *Mytilus* is a secondarily formed structure which overrides the 'teeth,' is full of interest and importance. *Dreissensia*, in his hands, is removed from the Mytilidæ; and his discovery that, in respect to the retention of larval ('prodissoconch') crenulations and the non-development of true 'teeth,' the adult *Ostræa* and the Pectens are, as it were, persistently embryonic, is most luminous, seeing it comes at a time when the study of several of the great groups of animals is showing us that, as concerns individual organs, the lowest term is not unfrequently retained by the most generally specialized forms.

Since the publication of this most important monograph, Bernard has briefly announced the discovery,[3] among some mollusca collected by M. Filhol and others in the Islands of Stewart and St. Paul, of two new Pelecypoda, *Hochstetteria* and *Condylocardia*. For the latter he is compelled to create a new family; and the former excites

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[1] C. Hedley, Ann. and Mag. Nat. Hist., ser. VI, vol. xvii, p. 111.
[2] F. Bernard, Bull. Soc. Geol. France, ser. III, tom. xxiv, p. 412.
[3] F. Bernard, Bull. Mus. Hist. Nat. Paris, 1896, p. 193.

our interest greatly, for it appears to be a persistently embryonic Mytiloid with a wholly internal ligament.

It may be doubted if, in our superfluity of discussion upon animate nature as to what may have happened in the past, we are not prone to overlook that which may be happening to-day; and, for this reason, much interest appears to me to attach to a paper by Professor Brooks of Baltimore in which, returning to the study of an azygos, siphonal tentacle, which he described in *Yoldia* in 1874, he adduces reason for believing[1] that it is an organ "of late specialization. not thoroughly settled in position."

Continuing his work on the Pholadidæ, Sigerfoos, in a preliminary paper full of interest, has shown[2] that the larva of *Xylotrya fimbriata* is possessed of a long tongue-shaped 'foot' with a byssus organ, and of free mantle-lobes; and that burrowing is commenced by a conjoint mechanical action of the former and specially developed 'shell-teeth.' It is an interesting circumstance that during Sigerfoos' investigation Lloyd has advanced good reason for concluding[3] that in *Pholadidea penita* atrophy of the 'foot' takes place after that organ, by a muscular effort and the utilization of 'grit,' has excavated the burrow; and that in the case of the unfortunate oyster, Schiemenz has adduced facts which show[4] the opening of the valves by starfish, and Letellier[5] their excavation by the boring-sponge, to be due to the exercise of sheer force.

Had these discoveries been made in the teleological days of our forefathers, the need of protection against starfishes would probably have been accounted a sufficient explanation of the overgrowth of the molluscan shell by the mantle.

As our thoughts are thus directed to the shell-sac and the 'shell-gland,' it may be remarked that Schmidt claims[6] to have confirmed the observation of Gegenbaur, in 1851, that the shell of *Clausilia* lies originally in a closed sac. He asserts that the same is true of *Succinea*; and his investigation heightens our interest in a problematical organ of the young *Sepia*, which Hoyle in 1889 likened[7] to the 'shell-gland,' but which appears to me more nearly comparable to the aboral bursa of *Sepiella*.

The interest of Hoyle's observation is further increased by the recent discovery by Bather[8] that immediately after its liberation from the egg-capsule the young *Sepia* attaches itself by a sucker-like expansion of its mantle.

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[1] W. K. Brooks and G. Drew, Johns Hopkins Univ. Circ., vol. xv, p. 85.
[2] C. P. Sigerfoos, t.c., p. 87.
[3] F. E. Lloyd, Science (N.S.), vol. iv, p. 188. Cf. also Zool. Anz., Bd. xv, p. 14.
[4] P. Schiemenz, Mitth.-Deutsch. Seefischereiver., Bd. xii, No. 6. Transl. in Journ. Mar. Biol. Assoc. (N.S.), vol. iv, p. 266.
[5] A. Letellier, Bull. Soc. Linn. Normand., ser. IV, vol. viii, p. 149.
[6] F. Schmidt, Zoolog. Jahrb. (Anat. Abth.), Bd. viii, p. 318.
[7] W. E. Hoyle, Proc. Roy. Phys. Soc. Edinb., vol. x, p. 58.
[8] F. A. Bather, Journ. Malac., vol. iv, p. 33.

Early in the year our indefatigable foreign member, Dr. Dall, reviewing the "Challenger" monograph on *Spirula*, revived the belief in an adhesive function of the aboral disk of that animal, stating facts[1] which led him to regard it as a mechanical sucker-like organ. He suggests that the species is sedentary and that the exposure of the shell generally observed is due to the animal having been wrenched from its attachment, and seeks to thus explain its non-capture in the free state.

While writing this there reached me a monograph by Dr. Einar Lönnberg, of Upsala, reporting[2] upon the examination of a well-preserved *Spirula reticulata* in the Zoological Museum of that University, from which he has been able to supplement our knowledge of the anatomy of the genus. He attributes to the aboral papilla and its associated parts a sensory function; and, moreover, boldly challenges Pelseneer's association of the Spirulas with the Œgopsoids. Admitting them 'Œgopsoids' so far as their eyes are concerned, he formulates a remarkable argument for thinking them more closely related to the nearest ancestors of the *Sepia-Loligo* group, which he forsooth would seek among the Ammonites! Much curiosity attaches to the considerations upon which he reaches the conclusion that *Spirula*, *Spirulirostra*, *Belosepia*, *Sepia*, are not directly related to each other, but "a series of forms in which the development has pursued the same course."

'Aboral fixation' has been very much in the malacological air during the year; for, in addition to the foregoing, Ruedemann has referred to *Conularia*[3] an organism which attached itself by its 'apex'; and the limits of probability have been reached in a suggestion of Verrill's[4] that it may be a member of a primitive ancestral form of Dibranchiate Cephalopod, in which the initial secretion of the shell-gland of the veliger-like young served for attachment!

Concerning *Nautilus*, Willey only yesterday laid before the Royal Society a description of the mode of oviposition and of the ripe ova,[5] and has published further notes,[6] embodying more particularly interesting deductions from the study of the nepionic shell, and a recognition of variations which have led him to a belief in a new variety (*N. pompilius* var. *Moretoni*). Vayssière, too, has published[7] a lengthy memoir on the external characters of the genus; with especial reference to dimorphism and the spadix, unfortunately in apparent ignorance of Haswell's observations,[8] the full account of which has meanwhile appeared.

In December our eyes were startled by the appearance of a paper by

[1] W. H. Dall, Science (N.S.), vol. iii, p. 243.
[2] E. Lönnberg, Lilljeborg Festskrift (Upsala, 1896), p. 99.
[3] R. Ruedemann, Amer. Geol., vol. xvii, p. 158.
[4] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 80.
[5] Proc. Roy. Soc., vol. lx, p. 467.
[6] A. Willey, Quart. Journ. Micro. Sci. (N S.), vol. xxxix, pp. 145 and 227.
[7] A. Vayssière, Ann. Sci. Nat. Zool., ser. VIII, vol. ii, p. 137.
[8] W. A. Haswell, Proc. Linn. Soc. New South Wales, ser. II, vol. x, p. 544.

Dr. H. P. Blackmore, in which,[1] convinced of the invariable association of certain Aptychi and Belemnites, he would have us believe that *Aptychus leptophyllus*, *A. Portlockii*, and *A. rugosus*, were appurtenances of the Belemnite organism, homologous forsooth with the pro-ostracum! His arguments show complete disregard of a sense of proportion of the cephalopod body, and lack of knowledge of the elements of anatomy indispensable to the orientation of its parts. We wish we could accept them, but we cannot.

The details in development of the radula from an epidermal invagination have in *Paludina* been worked out by Bloch.[2] The investigations of Pelseneer, Brook and Drew, and F. Bernard, beforementioned, once again impress on us the importance of 'convergence'; and a result like Hedley's relegation of certain species of *Angasella*, *Chloritis*, and *Thersites* to Tate's genus *Xanthomelon*,[3] from a knowledge of their visceral as well as their conchological characters, once more emphasizes how indispensable is a knowledge of the anatomy of recent forms if truly scientific progress is to be made.

In the way of experimental work, popular interest centres on the oyster, upon which, in relation to typhoid and other diseases, official reports have appeared[4] during the year. The creature has proved itself a veritable arch-glutton of germs, sewage, and abominations generally. The discovery by Professors Herdman and Boyce that the typhoid bacillus does not flourish in clean sea-water, and (in conjunction with other investigators) that neither sewage nor fresh water are favourable media to its existence, is reassuring, and calls for a suspension of judgment on the luscious bivalve.

Boyce and Herdman,[5] Chatin,[6] De Bruyne,[7] and others, have considerably advanced our knowledge of the so-called 'greening' of the oyster, erroneously thought by some to be a secretory process. Special interest attaches to their discovery that it marks the removal of deleterious matter by the agency of migratory cells; and it is for us a cause of congratulation that the year which has seen Lister elevated to the peerage finds our Mollusca in the thick of the phagocytosis blood-gland inquiry, from which mankind has more to hope than from the armed forces of the world.

Nor are our chosen class of animals to be longer excluded from the field of experimental physiology, for they have creditably contributed to a recent comparative study of respiratory exchange with the outside world[8] at different periods of growth and under experimental influence.

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[1] H. P. Blackmore, Geol. Mag., 1896, pp. 529–33.
[2] I. Bloch, Jenaische Zeitschr., Bd. xxx, p. 356.
[3] C. Hedley, Rep. Horn Exped., pt. ii (Zool.), p. 224. Cf. also Summary, p. 153.
[4] "Oyster Culture in Relation to Disease": 24th Ann. Rep. by Medical Officer Loc. Gov. Board, 1896.
[5] R. W. Boyce and W. A. Herdman, Rep. Lancashire Sea Fish Lab., 1895, p. 6, and also Brit. Assoc. Rep., 1896, p. 663.
[6] M. J. Chatin, Comptes Rend., tom. cxxii, pp. 796 and 1556.
[7] C. de Bruyne, Arch. d. Biol., tom. xiv, p. 161.
[8] Cf. H. M. Vernon, Journ. Physiol., vol. xix, p. 28.

Interesting in its bearings upon the adaptability of the molluscan organism is some additional evidence that *Limax agrestis* may become carnivorous, and that it may eat dead earthworms and aphides.[1] Let it be remembered, however, that Hunter kept a sea-gull alive for a year on barley, that rabbits have been known to thrive on frogs, and that cows and horses have been for a considerable period fed on fish.[2]

This brings me to the consideration of the Mollusca in relation to the more advanced work in cytology, now occupying so much attention.

As the result of appreciation of the extent to which continuity between the protoplasmic constituents of the animal body may be observed, the extension of ideas opposed to the cell-theory, that were first put upon a broad basis by Heitzmann in 1883,[3] in the hands of Sedgwick,[4] Schuberg,[5] and others, has raised questions of serious modification in our conceptions of the Metazoon. On the other hand, the master minds of Von Kölliker, Retzius, and Y. Cajal, and their associates, as the result of perfection of improved methods of microchemical technique, have brought about the great generalization that that desperate complex, the central nervous and sensory epithelial apparatus, is composed of discontinuous cells and their derivatives, arranged after the manner of a felt and not as a net-work.

The challenging of the cell-theory, with all recent work on the minute structure of protoplasm, has concentrated attention on the nucleus; and of the extreme to which Hertwig, Weismann and their followers have carried their conceptions of the part played by that structure in heredity, I need but remind you.

In the progress of these vitally interesting lines of inquiry, the Mollusca have come to play no mean part. Their structural units are large; and so marked are their nuclear elements, that the so-called 'centrosphere'—the most debatable object among cytologists—may in some of them be readily seen without recourse to reagents. *Lymnæa* and *Succinea* were among the first animals the nuclei of which arrested the attention of Bütschli,[6] that pioneer in the study of nuclear division, in the early seventies; and the term 'amphiaster' was two years later applied by Fol[7] to one of the earliest established phases in the process, after observations upon Pteropoda. In the hands of Mark, *Limax campestris* becomes responsible for perhaps the most bulky treatise[8]

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[1] C. Oldham, Zoologist, ser. III, vol. xx, p. 264; and also F. V. Theobald, t.c., p. 307.

[2] Cf. W. H. Flower, *Medical Times and Gazette*, February, 1872, p. 217.

[3] C. Heitzmann, "Microscopical Morphology of the Animal Body in Health and Disease." New York, 1883.

[4] A. Sedgwick. Cf. Quart. Journ. Micr. Sci. (N.S.), vol. xxxvii, p. 87.

[5] A. Schuberg, Sitzb. Phys. Med. Ges. Würzb., 1893, p. 44. Cf. also J. A. Hammar, Arch. Mikr. Anat., Bd. xlvii, p. 14.

[6] O. Bütschli, Zeitschr. Wiss. Zool., Bd. xxv, p. 201.

[7] H. Fol, Arch. Zool. Exper., 1877, p. 147.

[8] E. L. Mark, Bull. Mus. Comp. Zool. Harvard, vol. vi, p. 173.

ever inspired by cytological investigation of the egg of a single animal; and in the researches of Barfurth,[1] which so far revolutionized our knowledge of the so-called 'liver' of the invertebrata as to early necessitate the abolition of that term, *Arion* and *Helix* rank foremost.

Claiming, on your behalf, a leading consideration for the Mollusca in questions cytological, allow me to remind you of the interest attaching to the work of Kofoid and Castle, which I brought under your notice last year. It has been followed by an elaborate investigation into the cell-lineage of *Limax maximus*, by Meisenheimer,[2] while Pflücke would appear to be contemplating work with the molluscan nerve-cell.[3] Von Lenhossek has given us a study of the Cephalopod optic lobe and retina,[4] which for masterly treatment has never been surpassed. It suggests that in comparative histology the molluscan eye will play a rôle no less important than it has in anatomy in the hands of Grenacher, and in controversy in those of Huxley and Mivart.

In purely experimental cytology, Fujita has made some interesting observations upon the egg *Aplysia*, which appear to show[5] that its derivative embryo-cells may overcome the efforts of mutilation; and Crampton, dealing with *Ilyanassa obsoleta*, has for the first time succeeded in making an extended experimental study[6] of isolated blastomeres, which is full of interest.

Platner has already done excellent work with the molluscan nucleus; and, during the year, Auerbach,[7] De Bruyne,[8] Kostanecki and Wierzejski,[9] Bolles-Lee,[10] and McMurrich,[11] dealing with the 'astrosphere' and 'centrosome,' have involved *Fulgur*, *Helix*, *Paludina*, and *Physa* in what future historians will probably record as one of the most remarkable biological controversies of our time.

With advance of knowledge, the appearances expressed in the beforementioned terms have been held indicative of the existence of a supposed organ of the cell, equal almost in rank with the nucleus; and Kostanecki and Wierzejski (following Boveri, who attributed to the 'centrosome' the initiation of divisional activity) in lately studying *Physa* have gone further, and argued that the stimulus to division of the developing egg-cell depends mainly on the protoplasm and centrosomes, which they regard as physiologically complementary.

Excitement concerning these structures reached its highest pitch in

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[1] D. Barfurth, Arch. Mikr. Anat., Bd. xxii, p. 473.
[2] J. Meisenheimer, Zeit. Wiss. Zool., Bd. lxii, p. 415.
[3] Max Pflücke, op. cit., Bd. lx, p. 500.
[4] M. von Lenhossek, Arch. Mikr. Anat., Bd. xlvii, p. 45.
[5] J. Fujita, Zool. Mag. Tokyo, vol. viii, p. 47.
[6] H. E. Crampton, Arch. Entwick. Mech., Bd. iii, p. 1.
[7] L. Auerbach, Jenaische Zeitsch., Bd. xxx, p. 405.
[8] C. de Bruyne, Bull. Acad. Belge, ser. III, vol. lvi, p. 241.
[9] K. von Kostanecki and A. Wierzejski, Arch. Mikr. Anat., Bd. xlvii, p. 309.
[10] A. Bolles-Lee, "La Cellule," tom. xi, p. 225.
[11] J. P. McMurrich, Anat. Anz., Bd. xii, p. 534.

1891, in the assertion by Fol that in the sea-urchin (*Strongylocentrotus lividus*) he had observed a complicated metamorphosis, to which he gave the name "*quadrille des centres*"[1] and attributed paramount significance in heredity. Fol did not long survive this, but more recently a French Botanist, Guignard, professes to have observed a similar metamorphosis[2] in the lily, wherefore it might appear to be of prime importance in organic development.

Attention unprecedented has this 'attraction sphere' received within the last five years. It always lies in the focal point of radiations of the cell protoplasm, and it has accordingly appeared to some that it marks a centre of attraction of a convergent, and to others of origination of a radiate, activity. With extending inquiry, however, Fol's and Guignard's assertions have been found erroneous,[3] and a growing suspicion has arisen that the centrosome is no organ of the cell, but merely a condensation point, indicative of the passage of some energy within the cell, of the nature of which we know nothing.[4] Concerning the astrosphere, Morgan has lately shown,[5] by experiment on the egg of certain Echini and Tunicates, that under treatment with 1·5 per cent. salt solution, vital activities are set up within the egg which result in the appearance *ad hoc* of 'astrospheres' that closely resemble those of normal divisional activity, and may be induced during periods at which, according to prevailing deduction, their appearance ought to be impossible.

In view of this, it may be asked whether with the egg, as with the adult organism, we are not in error in generalizing upon this or that part considered alone. The entire form and habitus of both animal and cell are the expression of co-ordinate activity between its different parts, which must be studied collectively.

We are stimulated by ideas, but we live and advance by knowledge.

Returning to the Mollusca with this thought in mind, we note that during the year Verrill has well-nigh demolished the long-languished 'schematic mollusk,' building up[6] a plausible argument for the origin of the great groups of Mollusca from free-swimming forms similar to the present veligers and pro-veligers. As concerning the truth that the Polyplacophora are in respect to their bilateral symmetry primitive, but in respect to the terminal anus highly specialized, his reasoning is most forcible. Our conceptions of larval forms of invertebrates have become less stereotyped with advancing years; and it may be remarked that since the appearance of Verrill's paper a most beautiful study of the larvæ of marine annelids has

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[1] H. Fol, Arch. Sci. Phys. et Nat. Geneva, ser. III, vol. xxv, p. 393. Also Anat. Anz., Bd. vi, p. 266, and Comptes Rendus Acad. Sci. Paris, tom. cxii, p. 877.

[2] L. Guignard, Ann. Sci. Nat. Bot., ser. VII, tom. xiv, p. 163.

[3] Cf. Wilson and Mathews, Journ. Morph., vol. x, p. 319; J. B. Farmer, Ann. Bot., vol. vii, p. 393.

[4] Cf. J. B. Farmer, Sci. Progress, vol. i (N.S.), p. 141.

[5] T. H. Morgan, Arch. Entwick. Mech., Bd. iii, p. 339.

[6] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 91.

appeared by Häcker,[1] revealing evidence of structural dissimilarity among the various forms which, by analogy, materially strengthens Verrill's case. The construction of archetypes, and the creation of recesses in our classificatory schemes and museums for the reception of hypothetical ancestral groups, are objectionable practices; and we, therefore, the more regret the presence in Simroth's volume on the Acephala of the German Plankton Expedition of a supposed 'hypothetical primitive mollusc'—said to have lived between tide-marks in the littoral zone, and to have had a hemi-pelagic larva!

Many bushels of apples had fallen to the earth before that which led Newton to consider gravitation, and every milkmaid was aware of the fact which, in Jenner's mind, laid the foundation of the science of preventive medicine. But there are ideas and 'ideas.' In human progress no one does you a greater service than he who demolishes a heresy; and the real worker in science is he who fairly and squarely records a fact. If he have an idea, let him cherish it; another will ere long intersect it, much to his advantage.

Among workers in science we now meet with signs of uneasiness concerning the biological outlook; while in the popular mind the notion seems to have arisen that with the historical establishment of the principle of evolution the field is exhausted. To the serious student, however, definitions of classes which sufficed for our immediate predecessors will not suffice in the extended state of our knowledge. The characters common to all living members of a group are not those of all that have become extinct. Palæontology has shown us that many a structural feature which, from the study of the living alone, we have long regarded as the late outcome of a long series of evolutionary changes, has been anticipated in early geological times; and we are prone to inquire whether many of our existing groups do not carry us back to an assemblage of ancestors (i.e. may not be polyphyletic) rather than to a single progenitor as is generally assumed. In a word, the field is widening, especially in the department of palæontology, and its real extent is but now becoming obvious.

The significance of larval forms among invertebrates has been much under discussion in recent years. No one now dreams of attaching to the 'gastrula' the far-reaching phylogenetic significance which Hæckel claimed for it in 1873. The claims of the plakula, planula, and other early larval differentiations have to be considered.[2] Concerning the later-formed types of larvæ, I wish especially to point out that while during recent years the idea has grown that the Nauplius may be wholly secondary, Verrill, on behalf of our chosen class of animals, has recently defended[3] the earlier notion that

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[1] V. Häcker, Zeit. Wiss. Zool., Bd. lxii, p. 74; and also Zool. Jahrb. (Anat. Abth.), Bd. viii, p. 245.

[2] Cf. E. B. Wilson, Journ. Morph., vol. vi, p. 368, and also J. P. McMurrich, Biol. Lect. Wood's Holl, 1890 (Boston, 1891), p. 79.

[3] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 91.

they are primitive, and indicative of stages in phylogeny. His action imposes on us the necessity for paying foremost attention to those characters in mollusca which may be of larval significance, and especially to such as both living and fossil forms may present.

During the last few years, much interest has attached to a consensus of opinion among specialists that the Phyllopoda lie near the base of the Crustacean series, and to the growing idea that they may be closely related to the Trilobites. Beecher, from the study of specimens of *Triarthrus Becki*, in which the appendages are preserved, has substantiated this; and shown us,[1] what to my mind is incomparably more important, that in the Trilobite, as in the Nauplius, the first pair of appendages are prostomial, antenniform, and uniramous, and that the two pairs which follow are peristomial and biramous. When we consider further that the Trilobite in its general characters most nearly combines those of Nauplius and the Phyllopod, which is developmentally a sort of expansion of the Nauplius; that segmentation and 'cephalization' of the arthropod body are secondary processes, which can be accounted for by growth and development; that many of our decapods themselves pass through a Nauplius stage; and that the 'median eye' of the Nauplius has been found attached to the brain, altogether hidden beneath the exoskeleton, in adults of even the more familiar decapods[2]; our interest in the larva and in all questions of Crustacean phylogeny is heightened, in a manner impossible by any but the comparative morphological method.

Tasmania has recently yielded us,[3] in the *Anaspides* of Thomson, an annectant crustacean type; and within the last three months Calman, minutely comparing this with the Palæozoic pod-shrimps so long anomalous, has left little room for doubting[4] that it carries the decapod type a stage lower than the lowest living schizopod.

As affecting our views of the phylogeny of the Crustacea, the observations which I have here brought together appear to me to have achieved a far-reaching result, impossible from the exclusive study of either the living or the extinct: and when we consider that specialization of recent years has given us a school of zoologists brought up in little short of contempt for palæontology, it behoves us to take the lesson to heart. The observations do more; they demand of us a more careful study of palæontology, as a branch of morphology—especially as it may bear upon larval characters, and such particularly as may be retained by the adult in a condition capable of fossilization. They show us that we are wasting too much time and energy on speculation as to what may have happened during the evolution of living organisms, to the ignoring of what *has* happened; for, whatever may have been the changes, they must have left their impress in the rocks. I would

1 C. E. Beecher, Amer. Journ. Sci., ser. IV, vol. i, p. 251. Cf. also Amer. Geol., vol. xv, p. 93.
2 Cf. C. Bumpus, Zool. Anz., Bd. xvii, p. 176.
3 G. M. Thomson, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 3.
4 W. T. Calman, Trans. Roy. Soc. Edinb., vol. xxxviii, p. 787.

thus plead for palæontology, not alone considered, however, as a field which is most likely to yield us tangible results which shall be worthy the name of scientific; and would direct your attention to work which may yet be done upon the protoconch, nepionic shell, and shell-growth, to the work already achieved in this direction by Hyatt for the Cephalopoda, and by Jackson and Bernard for the Pelecypoda, and to a laudable attempt which during the year has been made by the Countess von Linden to deal in the manner indicated[1] with the phylogeny of shell-ornamentation.

The determination of the nature of things will ever be impossible to us, with our limited senses; we can seek but the true reason of phenomena.

You reply that our vocations and the necessities of life are so varied that we cannot all be palæontologists and embryologists. True: but we can all meet in this room for mutual interchange of ideas and comparison of notes, which is the next best thing; and co-operation becomes the more necessary as the field enlarges. When, in this year of our national rejoicing, we reflect upon the resources of the Malacologist of 1837—Scientific Societies and Journals in their infancy; for books, Blainville, the elder Sowerby, Hanley, Deshayes, Lamarck, costly and scarce; biological laboratories undreamed of; the deep sea unknown; India and Polynesia a sealed book; no Zoological Record; no Herrmannsens' Index of Genera; no Agassiz; no Marschall; no Scudder; the difficulties of transport; and, above all, the lack of facility for personal intercourse with our fellow-workers—we are overwhelmed in the realization of progress and our sense of gratitude that in this England of ours the ideal of the world's requirements is most nearly to be found. Without wishing to be disrespectful, I am bold to assert that, to my mind, we in London, living under conditions such as are not to be obtained elsewhere in the wide world, with the eye of the universe upon us, and looked up to for guidance and authority, are not making the most of our opportunities of intercommunication. Personal interest, which should be the *bête noir* of the man of science, enters too frequently into our considerations; and not a few of our scientific papers which oft appear in private journals would be the better, our progress the healthier, and our task as investigators the easier, for the refining influences of public discussion and the editorial jurisdiction of a learned society.

The earnest student of science leads a charmed life; and 'work' is to him something nobler than a compulsory adjunct to the tedium of a round of pleasure and selfishness, since he lives in and for the sacred duty of unravelling the pages of Nature. As a method in Zoology, the inductive is his most reliable; but so long as he continues to observe, compare, and confirm, rejecting the non-confirmable, remembering that zeal without knowledge is in science futile, and that random rhetoric is not argument, he need have no

[1] Countess M. von Linden, Zeit. Wiss. Zool., Bd. lxi, p. 261.

fear for the future, 'practical wisdom' and the simple addition table notwithstanding. But as the Zoologist's is of all branches of science the most humanizing, let him make the best of access to his fellow-workers.

I now leave you in the hands of one more competent than myself to direct your path. I am what is known as a 'vertebrate man'; and, in retiring, I must thank you for the privilege of having been compelled to devote as much of my time and energy as could be spared to fields somewhat off my beaten track—a discipline which I can confidently recommend to you all. Under the circumstances in which I have been placed, I have done my best to serve you rather as a teacher, upon whom it is incumbent that he should keep a watchful eye on the whole field in his department of science. Let me assure you of my fullest sympathy in the future; and recommend to your earnest consideration, as Malacologists, an inspiration we owe to the Pearly Nautilus—

"Build thee more stately mansions, O my soul,
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by life's unresting sea!"